# WELCOME TO AP Physics I

Dear AP Physics I Student:

AP Physics I is one of the most challenging AP classes at Southern Lehigh and perhaps one of the most challenging courses that you will ever take. Despite the enhanced difficulty of the course, I want you know to that I am here to support you and I gauge my success as a teacher on your success as a student. I am committed to working side-by-side with you throughout the year to help you meet your learning goals. In order to meet these goals, you will need to develop new thinking and analysis skills beyond mere memorization, requiring you to understand the course topics at a truly fundamental level. If you work hard and seek help when you need it, you will succeed!

The following packet is our Summer Assignment, which is a review of basic math operations and an introduction to simple motion. Please read the instructions on the front page of the assignment to know exactly what needs to be done. The assignment is due the first day of class. We will have a **quiz during the first week of school** on the material covered in the assignment, including the online lessons. The course is much easier if you have a support system. I encourage you to form a small (2-3 people), productive study group and begin by working on the summer assignment together. Also, you might want to consider purchasing an AP Physics review book such as "Cracking the AP Physics I Exam" published by Princeton Review (used books are just fine and significantly cheaper). Our main textbook will be in electronic form, so if you are the type of person who prefers a physical book in hand, then you might want to strongly consider acquiring a review book of some kind.

Remember, this assignment is a review of common math operations that will be used throughout the course. If you are feeling overwhelmed, you may want to talk to me about the pacing and structure of the course to see if it is a good fit for you. You may email me at deytonj@slsd.org if you have questions regarding the assignment (I will check my email periodically throughout the summer).

Have a great summer! Work hard and you will succeed!

Mr. Deyton

**AP Physics 1 Summer Assignment**

I. *As is evident in the AP Physics I Syllabus, we must cover a large number of topics before the test in May. This necessitates a very fast pace. This summer homework will allow us to start on the Physics subject matter immediately when school begins. This assignment is an introduction to Chapter 2 in the textbook and a math review to brush up on valuable skills, and perhaps a means to help assess whether you are correctly placed in Advanced Placement Physics I.*

II. *Physics, and AP Physics I in particular, requires an exceptional proficiency in algebra, trigonometry, and geometry. In addition to the science concepts Physics often seems like a course in applied mathematics. The following assignment includes mathematical problems that are considered routine in AP Physics I. This includes knowing several key metric system conversion factors and how to employ them.*

III. *The attached pages contain a brief review, hints, and example problems. It is hoped that combined with your previous math knowledge this assignment is merely a review and a means to brush up before school begins in the fall. Please read the text and instructions throughout.*

IV. **What is due the first day of school?**

A. **Problems 1 to 5 of the Math Skills Worksheet (next 3 pages of this packet).**

• Write your answers on the "Answer Sheet" provided at the end of the packet. You will be graded for correctness on these problems.

B. **Complete the AP Physics I Introduction to Kinematics**

**Go to the Physics Classroom website. Search the "Physics Tutorial" section to the left for the "1D-Kinematics" introduction. You can find the website by following this link: http://www.physicsclassroom.com/Physics-Tutorial/1-D-Kinematics**

• Once you have found the 1-D Kinematics Tutorial website, carefully work through the first three lessons:

∗ Lesson 1 -Describing Motion with Words
∗ Lesson 2 -Describing Motion with Diagrams
∗ Lesson 3 -Describing Motion with Position vs. Time Graphs
∗ As you go through the lessons, it is recommended that you write down your work for all of the "Check Your Understanding" exercises at the end of each section. Bring these exercises to class the first day of school so that we may review them during Spartan Period and before/after school to provide clarity as quickly as possible.

*V. Expectations for the first three days...*

- *Mr. Deyton will grade and return your Summer Assignment Math Skills Worksheet, allowing you to assess your readiness for the course. You, the student, will need to seek assistance immediately if you feel that you are not adequately prepared for the coursework ahead. Help from Mr. Deyton can be obtained during Spartan Periods and before/after school.*

- *You will receive a quiz on introductory Kinematics.*

# Math Skills Worksheet

1. The following are ordinary physics problems. Place the answer in scientific notation when appropriate and simplify the units (Scientific notation is used when it takes less time to write than the ordinary number does. As an example 200 is easier to write than $2.00\times10^{2}$, but $2.00\times10^{8}$ is easier to write than 200,000,000). Do your best to cancel units, and attempt to show the simplified units in the final answer.

   a. $T_s = 2\pi\sqrt{\dfrac{4.5\times10^{-2}\,kg}{2.0\times10^{3}\,kg/s^2}} =$ _____

   b. $F = \left(9.0\times10^{9}\,\dfrac{N\cdot m^2}{C^2}\right)\dfrac{\left(3.2\times10^{-9}C\right)\left(9.6\times10^{-9}C\right)}{\left(0.32m\right)^2} =$ _____

   c. $\dfrac{1}{R_p} = \dfrac{1}{4.5\times10^{2}\,\Omega} + \dfrac{1}{9.4\times10^{2}\,\Omega}$ $R_P =$ _____

   d. $K_{max} = \left(6.63\times10^{-34}\,J\cdot s\right)\left(7.09\times10^{14}\,s^{-1}\right) - 2.17\times10^{-19}\,J =$ _____

   e. $\gamma = \dfrac{1}{\sqrt{1-\dfrac{2.25\times10^{8}\,m/s}{3.00\times10^{8}\,m/s}}} =$ _____

2. Often problems on the AP exam are done with variables only. Solve for the variable indicated. Don't let the different letters confuse you. Manipulate them algebraically as though they were numbers.

   a. $K = \dfrac{1}{2}kx^2$ , $x =$ _____

   b. $T_p = 2\pi\sqrt{\dfrac{\ell}{g}}$ , $g =$ _____

   c. $F_g = G\dfrac{m_1 m_2}{r^2}$ , $r =$ _____

   d. $mgh = \dfrac{1}{2}mv^2$ , $v =$ _____

   e. $x = x_o + v_o t + \dfrac{1}{2}at^2$ , $t =$ _____

   f. $B = \dfrac{\mu_o}{2\pi}\dfrac{I}{r}$ , $r =$ _____

   g. $x_m = \dfrac{m\lambda L}{d}$ , $d =$ _____

   h. $pV = nRT$ , $T =$ _____

   i. $\sin\theta_c = \dfrac{n_1}{n_2}$ , $\theta_c =$ _____

   j. $qV = \dfrac{1}{2}mv^2$ , $v =$ _____

   k. $\dfrac{1}{f} = \dfrac{1}{s_o} + \dfrac{1}{s_i}$ , $s_i =$ _____

3. Science uses the ***KMS*** system (***SI***: System Internationale). ***KMS*** stands for kilogram, meter, second. These are the units of choice of physics. The equations in physics depend on unit agreement. So you must convert to ***KMS*** in most problems to arrive at the correct answer.

| | | |
|---|---|---|
| kilometers (*km*) to meters (*m*) | minutes (*min*) to seconds (*s*) | gram (*g*) to kilogram (*kg*) |
| centimeters (*cm*) to meters (*m*) | hours (*hr*) to seconds (*s*) | Celsius ($^oC$) to Kelvin (*K*) |
| millimeters (*mm*) to meters (*m*) | days (*d*) to seconds (*s*) | atmospheres (*atm*) to Pascals (*Pa*) |
| nanometers (*nm*) to meters (*m*) | years (*yr*) to seconds (*s*) | liters (*L*) to cubic meters ($m^3$) |
| micrometers ($\mu m$) to meters (*m*) | | |

Other conversions will be taught as they become necessary.

What if you don't know the conversion factors? Colleges want students who can find their own information (so do employers). Hint: Try an internet search for the above units or use your old science/math class notes. Enjoy!

a. 4008 *g* = _____ *kg*

b. 1.2 *km* = _____ *m*

c. 823 *nm* = _____ *m*

d. 298 *K* = _____ $^oC$

e. 0.77 *m* = _____ *cm*

f. $8.8 \times 10^{-8}$ *m* = _____ *mm*

g. 1.2 *atm* = _____ *Pa*

h. 25.0 $\mu m$ = _____ *m*

i. 2.65 *mm* = _____ *m*

j. 8.23 *m* = _____ *km*

k. 5.4 *L* = _____ $m^3$

l. 40.0 *cm* = _____ *m*

m. $6.23 \times 10^{-7}$ *m* = _____ *nm*

n. $1.5 \times 10^{11}$ *m* = _____ *km*

4. Solve the following geometric problems.

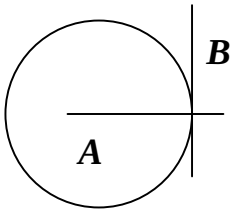
a. Line ***B*** touches the circle at a single point. Line ***A*** extends through the center of the circle.

i. What is line ***B*** in reference to the circle?

_____

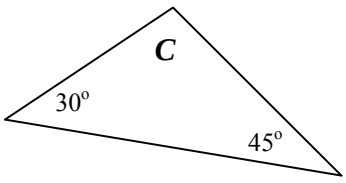
ii. How large is the angle between lines ***A*** and ***B***?

_____



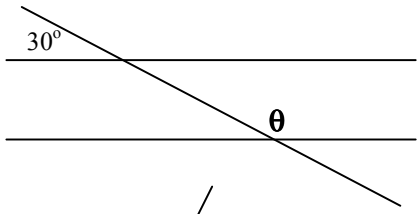

b. What is angle ***C***?

_____



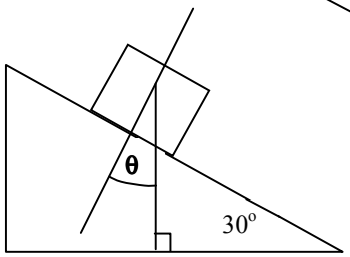

c. What is angle **θ** ?

_____




d. How large is ***θ***?

_____



e. The radius of a circle is 5.5 *cm*,

i. What is the circumference in meters?

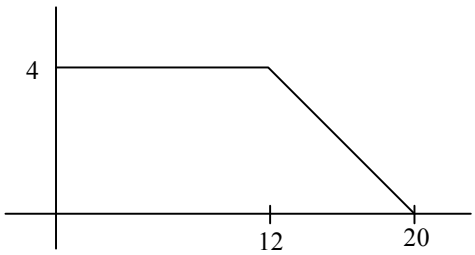
_____

ii. What is its area in square meters?

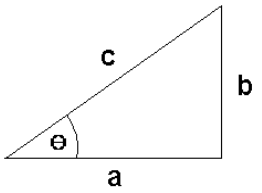
_____

f. What is the area under the curve at the right?

_____




5. Using the generic triangle to the right, Right Triangle Trigonometry and Pythagorean Theorem solve the following. ***Your calculator must be in degree mode.***




g. $\theta = 55^{o}$ and ***c*** = 32 *m*, solve for ***a*** and ***b***.

_____

h. $\theta = 45^{o}$ and ***a*** = 15 *m/s*, solve for ***b*** and ***c***.

_____

i. ***b*** = 17.8 *m* and $\theta = 65^{o}$, solve for ***a*** and ***c***.

_____

j. ***a*** = 250 *m* and ***b*** = 180 *m*, solve for $\theta$ and ***c***.

_____

k. ***a*** =25 *cm* and ***c*** = 32 *cm*, solve for ***b*** and $\theta$.

_____

l. ***b*** =65 *cm* and ***c*** = 104 *cm*, solve for ***a*** and $\theta$.

_____

Math Review Answer Sheet NAME _____

*Please write your answers neatly in the spaces provided. Provide all units where appropriate.*

## Section 1 – Calculations with Scientific Notation

a. _____

b. _____

c. _____

d. _____

e. _____

## Section 2 – Algebraic Manipulations

a. _____

b. _____

c. _____

d. _____

e. _____

f. _____

g. _____

h. _____

i. _____

j. _____

k. _____

## Section 3 – Unit Conversions

a. _____

b. _____

c. _____

d. _____

e. _____

f. _____

g. _____

h. _____

i. _____

j. _____

k. _____

l. _____

m. _____

n. _____

## Section 4 – Geometric Analysis

ai. _____

aii. _____

b. _____

c. _____

d. _____

ei. _____

eii. _____

f. _____

## Section 5 – Trigonometric Analysis

g. _____

h. _____

i. _____

j. _____

k. _____

l. _____